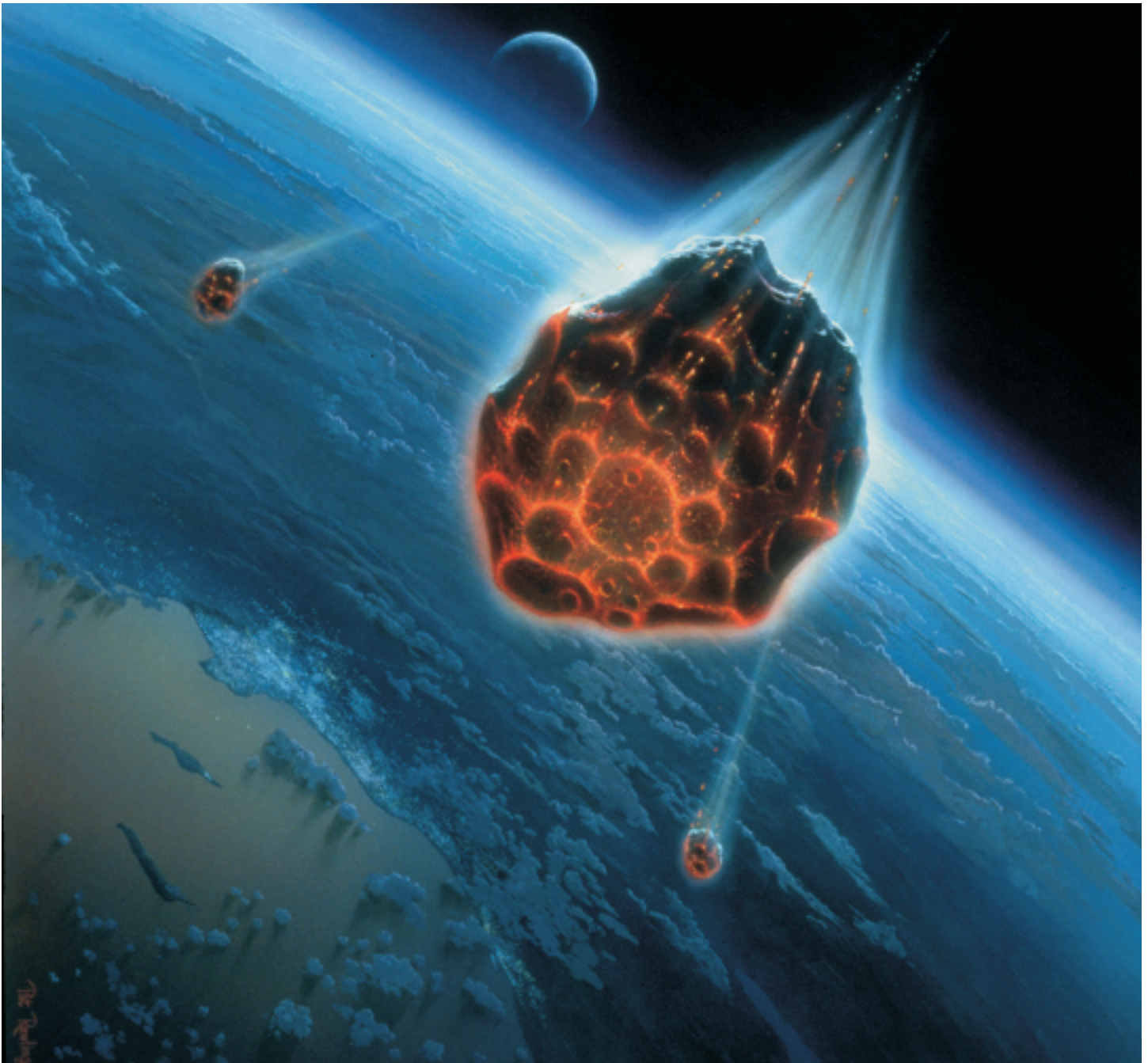


Lyndon B. Johnson Space Center

roundup



On the cover

The Tagish Lake meteorite that entered the Earth's atmosphere over the Canadian Arctic in 2000 is offering scientists clues to the origins of life. Read more about what JSC scientists have discovered about this rare discovery on page 3.



To my fellow JSC team members

THE NEW YEAR brings changes for many of us, as it certainly did for me as I began my new job as JSC Associate Director, Management, replacing Randy Gish, who is headed to Kansas to enjoy retirement.

2007 will also bring change and challenge to JSC. The shuttle and station programs will continue working together to bring our orbiting laboratory closer to completion. The new year also brings us another year closer to the retirement of the space shuttle, a program many of us grew up with. At the same time, the Constellation Program is moving forward, supporting our exploration mission.

Our future comes closer to us every day and we need to be ready for it. The center is beginning an in-depth process to understand and articulate JSC's core products and services, as well as important collaborations necessary to advance the Vision for Space Exploration. This process will help us plan for critical skills and capabilities to accomplish the business of JSC. Most importantly, I am committed and passionate about making sure that the JSC workforce is prepared for every opportunity to lead humans past low-Earth orbit.

The prospect of change can create uncertainty and is often the subject of rumors. Over the next couple of months, you'll hear more about our efforts to focus on JSC's core products and strengths in human spaceflight. I will be talking with organizations across the center to make sure everyone's voice is heard as we work together to prepare JSC for the future. Our goal is to build the roadmap for JSC's future, a future that holds promise for every member of the JSC team.

I look forward to working with Mike and Bob and am honored to work for all of you.

Lucy Kranz

JSC Associate Director, Management

Tagish Lake meteorite

by Bill Jeffs

JSC SCIENTISTS FIND PRIMORDIAL ORGANIC MATTER IN METEORITE

A meteorite that fell on Western Canada seven years ago has organic materials that formed at the edge of or outside the solar system, according to scientists at Johnson Space Center. The discovery advances the quest to find the origins of life.

A team of scientists at JSC found the organic materials in the Tagish Lake meteorite. The meteorite is a rare kind of space rock called a carbonaceous chondrite. It is rich in organic (carbon-bearing) compounds that are essential to life.

Organic matter in meteorites is a subject of intense interest because this material formed at the dawn of the solar system and may have seeded the early Earth with the building blocks of life. The Tagish Lake meteorite is especially valuable for this work because much of it was collected immediately after its fall over Canada in January 2000 and has been maintained in a frozen state, minimizing terrestrial contamination. The collection and curation of the meteorite samples preserved its pristine state.

In a paper published in the Dec. 1, 2006, issue of the journal *Science*, the team, headed by NASA space scientist Keiko Nakamura-Messenger, reports that the Tagish Lake meteorite contains numerous submicrometer hollow organic globules.

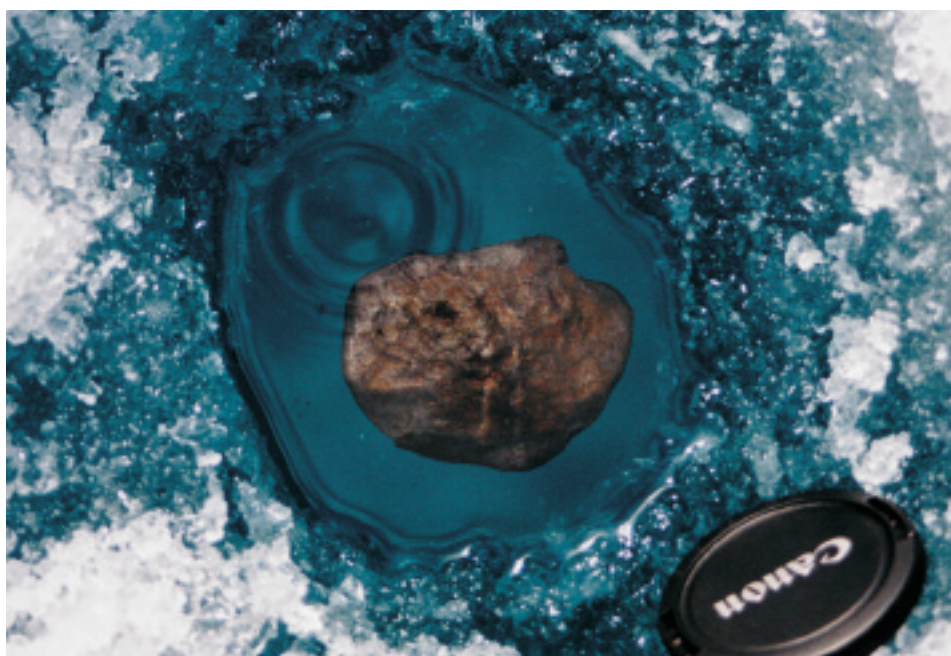
"Similar objects have been reported from several meteorites since the (1960s). Some scientists believed these were space organisms, but others thought they were just terrestrial contamination," said Nakamura-Messenger. The same bubble-like organic globules appeared in this freshest meteorite ever received from space. "But in the past, there was no way to determine for sure where these organic globules came from because they were simply too small. They are only 1/10,000 inch in size or less."

Two powerful new nanotechnology instruments installed in the scientists' laboratory at JSC in 2005 helped make the discovery possible. The organic globules were first found in ultra-thin slices of the meteorite with a new JEOL transmission electron microscope. It provided detailed structural and chemical information about the globules. The organic globules were then analyzed for their isotopic compositions with a new mass spectrometer, the Cameca NanoSIMS, the first instrument of its kind capable of making this key measurement on such small objects.

The organic globules in the Tagish Lake meteorites were found to have very unusual hydrogen and nitrogen isotopic compositions, proving that the globules did not come from Earth, or in fact from anywhere inside our solar system.

"The isotopic ratios in these globules show that they formed at temperatures of about -260° C, near absolute zero," said Scott Messenger, NASA space scientist and coauthor of the paper. "The organic globules most likely originated in the cold molecular cloud that gave birth to our solar system, or at the outermost reaches of the early solar system."

The type of meteorite in which the globules were found is also so fragile that it generally breaks up into dust during its entry into Earth's atmosphere, scattering its organic contents across a wide swath. "If, as we suspect, this type of meteorite has been falling onto Earth throughout its entire history, then the Earth was



Initial analysis showed the Tagish Lake meteorite was a type of carbonaceous chondrite—a rare, organically rich, charcoal-like class of meteorites.

seeded with these organic globules at the same time life was first forming here," said Mike Zolensky, NASA cosmic mineralogist and coauthor of the paper.

The origin of life is one of the fundamental unsolved problems in natural science. Some biologists think that making a bubble shape is the first step on the path to biotic life. "We may be a step closer to knowing where our ancestors came from," Nakamura-Messenger said.

Star City

by John McBrine and Kendra Phipps

Ask astronaut Doug Hurley to describe a typical day at his job, and his answer is short and sweet.

"There isn't one," he said.

That's probably to be expected, since his office is a continent away from home and handles everything from astronaut training to social events. Not to mention that its location was one of the most closely guarded secrets of the former Soviet Union.

Hurley is NASA's current director of operations, Russia (DOR), in Star City, which is approximately 25 miles northeast of Moscow. In support of the International Space Station Program, the DOR Office handles the logistics of training American astronauts on Russian systems. That includes coordinating crew members' travel arrangements, planning their training schedules, taking care of their housing needs and much more. Hurley said that he enjoys the unpredictability of the work.

"That's one of the great things about the job—every day is completely different from the last," he said.

Things have certainly changed from the days when Americans would not have been allowed in Star City at all.

A secret city

The Cosmonaut Training Center, now known as the Gagarin Cosmonaut Training Center (GCTC), was established in 1960 and consisted of two components: the training facility itself and a small residential area—now known as Star City—for the center's support personnel, including the cosmonauts and their families. Both areas were cloaked in secrecy during the height of the Space Race. That began to change in 1972, when the Apollo-Soyuz Program was established by President Richard Nixon and Soviet Premier Alexei Kosygin. To prepare for this program, American astronauts visited GCTC to learn the necessary hardware and study the Russian language.



Just days prior to their launch to the International Space Station, Expedition 10 crew members Leroy Chiao (right) and Salizhan Sharipov (center) pose for a photo with cosmonaut Yuri Shargin in Star City, Russia. Star City is the home of NASA's DOR Office, which handles the logistics of training American astronauts on Russian systems.

NASA/Ingalls JSC2004E44239

NASA's collaboration and cooperation with the Russian space program only grew from there. In 1994, in support of the NASA/Mir Program, the DOR Office was established by astronaut and first DOR Ken Cameron. The office began with three NASA employees: Cameron, a flight surgeon and a payloads coordinator. Two foreign national employees were soon added: TechTrans International hired Natasha Doroshenko as the office manager and Alla Jiguirej as the interpreter/translator. The team supported the prime and backup U.S. crew members training for the Mir 18 mission.

Today, the office includes the DOR, a deputy DOR, a flight surgeon, six drivers and seven office staffers. Even with a much larger team, Doroshenko said that the DOR Office maintains its "strong focus on improving the quality of life for crew members who have to spend months away from their families while training."

Supporting international training

"Support for crews is the cornerstone upon which success in training is built," said Doroshenko.

The DOR Office provides that support in a myriad of ways. The staff handles transportation, lodging and logistical support for all NASA personnel traveling to Star City. It manages numerous visa and passport issues, often coordinating with U.S. Embassy personnel and the Russian Ministry of Foreign Affairs to ensure travelers are able to travel when required and are legally registered during their stay in Russia. Access to Star City and the GCTC are extremely tightly controlled, and the office staff ensures that travelers receive the necessary badging to complete their work. The staff also oversees the development and coordination of crew training schedules and maintains the training materials library.

The drivers are also extremely busy, safely transporting NASA personnel, including astronauts, to and from Sheremetevo Airport on a weekly basis. They also ferry NASA employees to and from NASA offices in Moscow, the Mission Control Center in Korolev and other places in the region.

With the nearest western-style restaurant, nightclub or gymnasium miles away, even social events are organized by the DOR Office. NASA personnel have, over time and with private contributions, established some recreational facilities onsite. The most famous and popular is "Shep's Bar," an oasis of Americana in the basement of one of the cottages. The value of places like Shep's Bar cannot be overestimated in such an isolated location, especially when the severe cold weather makes even a short walk or drive treacherous.

Culture shock

Juggling such a wide array of tasks would be difficult enough without the added culture shock of moving from balmy Houston to sub-zero Russia. While the weather can't be changed, the DOR Office staff does minimize the language barrier: The office personnel are all fluent in English and often find themselves acting as interpreters on many different topics, ranging from Russian history to medical issues.

Language and weather aside, Hurley said that it has been difficult adjusting to the traffic in Russia.

"It's horrible," he said with a laugh. "It makes Houston look like it's free-flowing."



The DOR Office staff in Star City coordinates training and other logistics for space station astronauts. Top row, from left: Anna Tomina, Alexander Vysotsky, Natalia Lobanova, Galina Zabruskova, Doug Hurley, Mike Belansky. Bottom row, from left: Alla Jiguirei, Ephim Udalov, Boris Lukyanov, Yuri Griminchuk, Yuri Salnikov, Ivan Markov, Larisa Okbrimovich. Not pictured: Vadim Lukyanov.



In this 2003 photo, Expedition 7 crew members Yuri Malenchenko (foreground) and Ed Lu practice in a Soyuz capsule simulator at the Gagarin Cosmonaut Training Center in Star City. One of the jobs of Star City's DOR Office is to coordinate training sessions such as this.

Doroshenko, who has moved to the United States and is now an Increment Training Integrator for Johnson Space Center's Training Division, said she sees things differently.

"The hardest thing to adjust to in the U.S. has been the big multilane highways," she said. "For people who have been to Russia and seen Russian driving this may seem weird; however, I keep aiming for the airport and end up downtown."

Something they can agree on is that they both enjoy the dynamic nature of the work they do for the space program. As Hurley said, there simply isn't a "typical" day.

"That's one of the benefits of working for a program that is so exciting," said Doroshenko.

Jiguirej, who is now NASA's Training Coordinator in Star City, also agrees. "That is what I mostly enjoy about the job—it's a very dynamic program, so there are lots of surprises we deal with."

Mementos in time

Crew patches help piece together NASA's spaceflight history

by Catherine E. Borsché and Brad Thomas



THE MOST highly identifiable symbol for each mission is the crew patch. This patch adorns the crew's flight suits and personalizes the mission story and upcoming mission highlights.

Today's astronauts launch with patches of their own design. And while one may just think of the crew patch as a unique identifier, it is much more than that.

"The patch is a big deal to every crew. It's probably the most visibly unique symbol of the mission, usually tells a story about the mission and is often a peek into the personalities of the people onboard," said Steve Robinson, STS-114 mission specialist and patch designer.

"They all have meaning," said Sean Collins, JSC Graphics technical lead. "Some have hidden meanings."

Collins used the STS-72 patch as an example of one with a hidden message. On the patch, a basketball is located in the shuttle payload bay, which represents a crew member who was a former basketball player.

The crew works intimately with the graphic artist throughout the patch design process. Once the crew members formulate a concept, they bring that concept, sometimes in sketch form, to the graphic artist for collaboration. According to Collins, in rare instances the artist might be instructed to create something from scratch for the crew to evaluate.

For the STS-114 crew patch, Robinson personally crafted the initial elements.

"The initial concept took shape over two days in my home studio. I roughed out three to four different concepts using pencil, colored felt pens and watercolor. Only one was really worth taking forward," he said. "I worked for years as a graphic designer as a side job, and I [had] always wondered what it would be like to design a mission patch."

There's a lot of teamwork involved in getting the patch just right.

"Basically, [the design] goes back and forth between the crew and Graphics," Collins said.

Before switching to computers, it would take a graphic artist up to 300 hours to create a patch. However, the genesis of computers has decreased that time to no more than 20 hours.

"The extent to which the patch tells the story of the mission varies widely. Some designs show every major aspect of the mission and crew, while other designs are more symbolic and tend to be simpler," Robinson said.

"For the graphic designer, mission patches present quite a challenge: to uniquely signify a spaceflight in an enclosed shape, using only seven colors and with a lot of text (up to 10 names)."

The most difficult part in the creation of a patch is not the artistic portion, but the approval process itself. Collins indicated that the hardest part is getting everyone to agree, which means approval can take as long as an entire year.

"Once the [crew's] commander says it's good to go, it goes to the ninth floor [in Building 1] and cannot be changed after that," Collins said.

The STS-114 patch had an arduous approval process due to a variety of special factors.

"There were at least 25 revisions. Some of these were due to the fact that the crew was assigned for almost four years before the mission actually flew, and the crew changed multiple times. We actually had 18 different names on the patch at various times," Robinson said. "The major revision was after the loss of *Columbia*, when we modified the patch design to honor the STS-107 crew and also gained three new crew members on STS-114."



Mission patch for the Gemini 5 spaceflight. The names of the prime crew members are on either side of a covered wagon, which symbolizes the pioneer spirit of space exploration.

Collins, who has worked on 37 crew patches—including both Return to Flight patches, STS-26 and STS-114—said he thoroughly enjoys his work. “It’s a part of history,” Collins said. “They are really fun to work on.”

The history of the patch is almost as illustrious as the history of the human spaceflight program itself.

Mercury astronauts launched only with the NASA insignia sewn on their suits. The Mercury patches we see today were created after the missions to commemorate those flights.

The first flight to use a patch in addition to the NASA patch was Gemini 4. This crew wore an American flag patch on the shoulders of their pressure suits. Nowadays, the American flag patch is a permanent addition to all the pressure suits worn by American astronauts. Those who fly aboard the shuttle but are not American citizens sport their own home country’s flag on their spacesuits.

Thanks to the efforts of Gemini 5 Commander Gordon Cooper, beginning with Gemini 5, all future human spaceflights would have a crew patch that would be designed, partially or entirely, by the crew of the mission. Cooper’s patch for Gemini 5 represented a covered wagon, which symbolized the pioneering nature of the Gemini flights.

The crew patch has also grown in popularity with the public. Patches are now considered collectors’ items, and many people clamor to obtain them for their personal space memorabilia collections. Not only are they an outward symbol of the crew’s identity and mission, but they are also a tangible example of how far we’ve come in the space program, and where we hope to go one day.

As Robinson said, “Every crew strives for originality, as every crew believes that (its) mission is the most interesting and special mission ever flown!”



The STS-114 patch design signifies the return of the space shuttle to flight and honors the memory of the STS-107 Columbia crew. The blue shuttle rising above Earth’s horizon includes the Columbia constellation of seven stars, echoing the STS-107 patch and commemorating the seven members of that mission. The dominant design element of the STS-114 patch is the planet Earth, which represents the unity and dedication of the many people whose efforts allowed the shuttle to safely return to flight.



STS-114 crew members, with their crew patches emblazoned on their launch and entry suits, wave at KSC employees as they prepare to board the transfer van awaiting to take them to Launch Pad 39B. Clockwise: Eileen M. Collins, mission commander, leads the way. James M. Kelly, pilot, is at front left. Crew members Wendy Lawrence, Charles J. Camarda, Andrew S. W. Thomas, Stephen K. Robinson and JAXA astronaut Soichi Noguchi follow.

Right: Astronaut Charles Conrad Jr. tweaks astronaut L. Gordon Cooper’s eight-day growth of beard for the cameramen while onboard the prime recovery vessel after their Gemini 5 flight. The Gemini 5 flight was the first in which the crew took on the design of the mission patch.



Evan Twyford of the Habitability Design Center was the winner of the recent JSC Office of Communications and Public Affairs essay contest that asked employees to answer the question, “Why is space exploration so vital to the nation?” Twyford won a trip to the STS-117 launch as a special guest of the center director and the right to have his essay published in this issue of the Roundup. Following is a short question-and-answer session with Twyford, followed by his award-winning essay.

There were also three runners-up: Amanda Stiles of USA, Melody Ringo with Boeing and NASA employee David Rutishauser, all of whom will receive VIP treatment and will view the STS-117 launch in the gallery of Mission Control. You can read their essays on JSC Features at <http://www.jsc.nasa.gov/jscfeatures>

How did you feel when you found out you won the contest?

How long did it take you to write your essay?

I was really surprised at first. When I first turned it in I thought “This is it—I am going to win.” But there is always a doubt.

I wrote the essay the night before it was due. It took about three hours.

What inspired you to write your essay?

I feel that as a designer and architect there is a lot of space-age influence in my daily work. You see the influence in popular design, in the movies, literature and art. There is a whole cultural and spiritual side to space exploration and how it influences people, and I really wanted to convey that in my essay.

What part of the launch are you looking forward to the most?

I am looking forward to the launch itself, but I am also excited about hanging out with Mike Coats—getting to meet him and hopefully meeting some other interesting people there.

I just hope it doesn’t get scrubbed too many times; I have my fingers crossed.

Why space exploration is so vital to the nation

by Evan Twyford



Why?

What is it that drives humans to explore? Is it the challenge, the adventure, the promise of some unknown reward? The most important question for the aerospace community right now is ‘Why?’ Why is space exploration important? For some, the question may be analogous to asking ‘What is the meaning of life?’ Sometimes we don’t know why we do something, we just do it. But the curiosity and the thirst for exploration is embedded in our psyche from the very beginning.

A natural curiosity

Explorers and travelers by instinct, humans have evolved as tool users and problem solvers. Crossing continents in search of sustenance, survival and a fascination with the unknown, we have always found ways of transporting our bodies and our consciousness to farther and farther destinations in a natural cycle of extension. This urge roots itself in our subconscious through generations of exploration.

In the twenty-first century, this drive to broaden our consciousness has certainly come of age. We apply knowledge to extend our bodies and our capabilities farther than was ever thought possible. We employ our technology in the creation of computers, cellular telephones and artificial intelligences that help us connect with each other and our machines. We are, in essence, expanding our collective consciousness and senses both locally and to the farthest reaches of the universe. Whether we realize it or not, we are on a quest for knowledge and growth.

The quest for knowledge

The quest for knowledge leads to growth, discovery and inspiration, and we use this knowledge to inspire people in their everyday work and to inspire students and children to continue their personal quests for knowledge, whatever they might be. Technology and products from the aerospace industry find applications in other fields, and thus strengthen our economy. Space exploration and the industries surrounding it create jobs for our citizens and education opportunities for our students, but take a look at the broader picture.

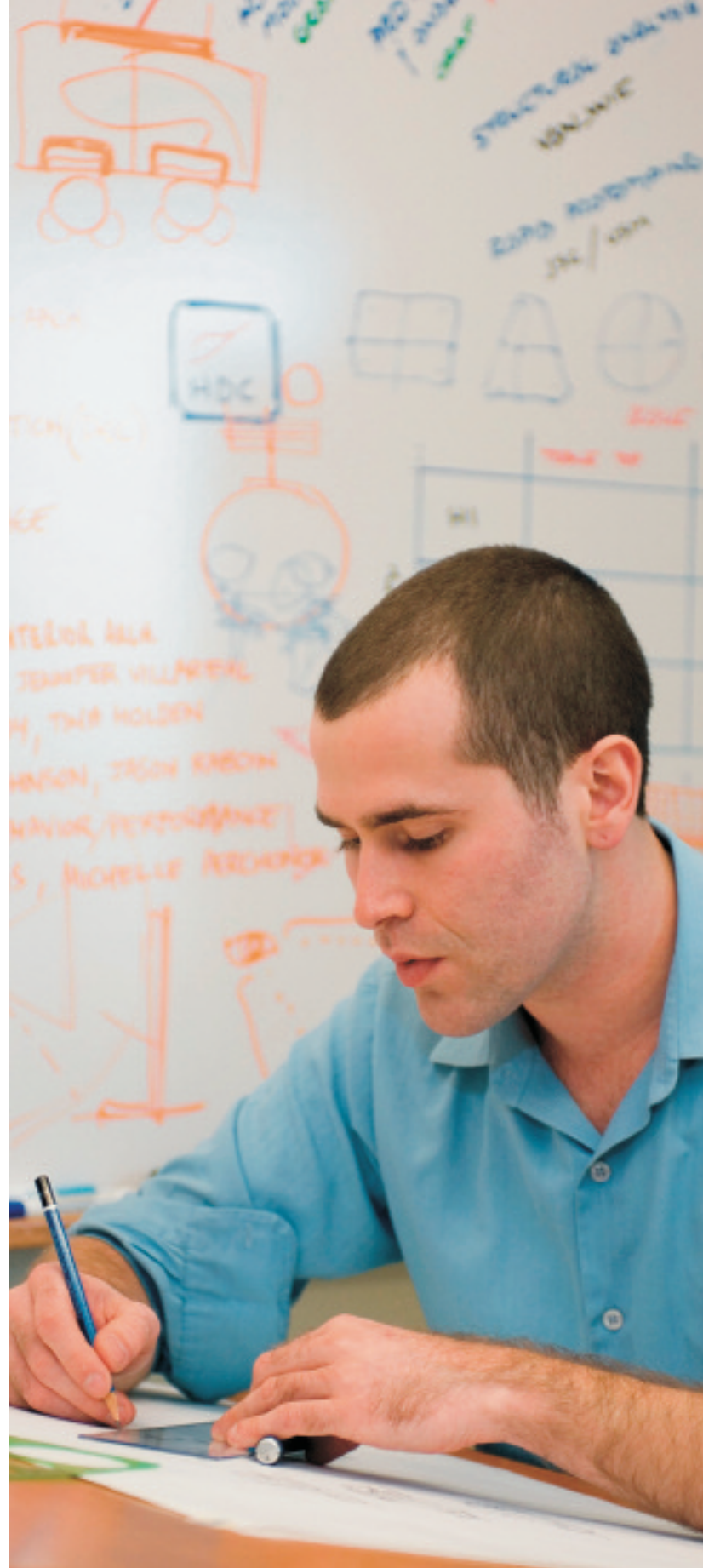
Space exploration is not only good for economy, but good for culture. The first space age and the Apollo program inspired endless amounts of art, design, film, literature, products, engineering and architecture, enriching the culture of the nation and fueling the creativity of our planet. The design of vehicles and tools for space exploration influences the design of products and architecture back on earth and the creation of more efficient systems and use of resources. So the industry adds to our collective knowledge, propelling us into the future and elevating us to a higher spiritual and universal consciousness. Sure there are pressing issues in need of solutions right here at home, but space exploration and all its benefits could be the most valuable long term investment we could hope for.

Achieving the collective goal

Most of all, space exploration has brought together some of the best thinkers in the world to achieve a common goal, creation and exploration of the unknown, and the entire planet has tuned in to ride alongside them. The spirit of exploration unifies people from different backgrounds, cultures and communities to learn and explore together, to achieve that ultimate goal. The goal that is embedded in our psyche from the very start. The curiosity and the courage to ask ‘Why?’

Why ask why?

So we find ourselves at the beginning again. Cultivating the same cycle of creation and extension of our knowledge that we have practiced for generations. We find that maybe the answer to our question was right in front of us the whole time. Perhaps the answer to the question was the question itself? It is the courage to ask ‘Why?’ that leads us on our quest, and we will continue our pursuit of that quest together, into space and into the future.



Evan Twyford of the Habitability Design Center team won the chance to go to the upcoming STS-117 launch with his winning essay.

Igniting innovations

by Catherine E. Borsché



Innovations in space technology often lead to practical applications here on Earth. The MicroMed DeBakey VAD (ventricular assist device) was designed with NASA fuel pump technology and is just one example.

What do a heart pump and a shuttle main engine have in common? They were both developed from the same technology—something that happens more than you might think.

The Office of Technology Transfer thrives on finding ways to create or repurpose technologies to fit NASA's mission.

"One of our favorite examples of technology that has been commercialized is a heart pump," said Michele Brekke, director of the Office of Technology Transfer. "The technology was something that NASA needed for space, and a company came along and realized, 'Hey, that technology has a dual use. You're using it for the main engines, but we could use it for the heart pump.' So they licensed that technology and commercialized the heart pump."

The traditional role of Technology Transfer used to be centered on the "spinning off" of new, innovative inventions. However, due to the multifaceted and dynamic world of technology today, NASA relies on many partnerships and collaborations with outside companies to create the products needed for living and working in space.

"The new spin on Technology Transfer is the 'spin in,' infusion or pull. NASA gains a technology from either industry or academia, whichever has invented that

technology, and we infuse it into our programs," Brekke said.

This method provides a cost savings to NASA, because the agency no longer has to nurture the budding invention from "womb to tomb," or start to finish. Once the technology or invention has been perfected for space, NASA buys it back from the company that did all the research and development. The cost of buying the finished product is cheaper than what NASA would have spent had it done all the work on its own.

Technology Transfer is faced with the challenge of anticipating the various program needs for exploration far into the future.

"First of all, we have to know what technologies we're looking for, which means our programs and mission directorates have to tell us what technologies they want infused. Even though it's simple to say that, it's extremely difficult," Brekke said. "As you can imagine, exploration is so complex and there are so many tentacles and facets to it, to sit down and say, 'Oh, I'm going to need that technology by the year 2020—go find it.' It's just not that easy."

Technology Transfer has programs that forecast what they might need 10 or 20 years down the road, and obtain concepts of what the programs need to accomplish their missions.

technology transfer

"A lot of it is common sense, and then we use our judgment and talk to folks to understand what would most likely be (necessary) technologies," Brekke said.

As evidence, Brekke noted how technology has evolved drastically just in our short lifetimes.

"I remember about 10 years ago when my kids were becoming teenagers, and I thought, 'Oh my gosh, I wish I had an electronic leash!' And now, do you know anyone that doesn't have a cell phone? Kids (who are) 8 years old are getting cell phones. Technology is just growing in leaps and bounds."

Despite NASA's recent efforts to "spin in" technologies, the agency still uses the old-fashioned method of creating and patenting inventions in its own backyard. This just illustrates how the genius and spark of its earlier days during the Apollo Program are still alive and well, although perhaps not as visible.

"We have innovators all over the center, and some are very prolific. There are some people that have as many as 40 patents," Brekke said. "They were born to be inventors."

However, creating innovative technologies is only a piece of the puzzle. The next step is protecting the invention with a patent. Obtaining a patent through the U.S. government ensures that no one can claim specific technology as his/her own discovery and ensures the ethical handling of an invention. An important Technology Transfer task is making the patent process straightforward.

Patent lawyers with the JSC Office of Chief Counsel participate with Technology Transfer colleagues in the evaluation of new technology invention disclosures submitted by inventors.

"Those (inventions) that are determined to have the requisite commercial and patent potential are assigned to a particular patent attorney's docket," Ed Fein of the JSC Office of Chief Counsel, said. "The attorney then assesses its patentability."

This is done typically through a patentability search. The results are then reviewed with the input of the inventors and other technical experts. After considering the legal requirements for the patent, the experts determine whether or not to prepare a patent application for invention, and either prepare it in-house or contract it out to a law firm with very close oversight.

"A patent application is a complex legal and technical document that must comply with patent laws and stringent requirements established by the U.S. Patent and Trademark Office (USPTO). Once the patent application is filed in the USPTO, it ultimately gets examined by a USPTO patent examiner. Our lawyers then 'prosecute' the patent application, which is a complex process between [the] attorney and patent examiner, and can

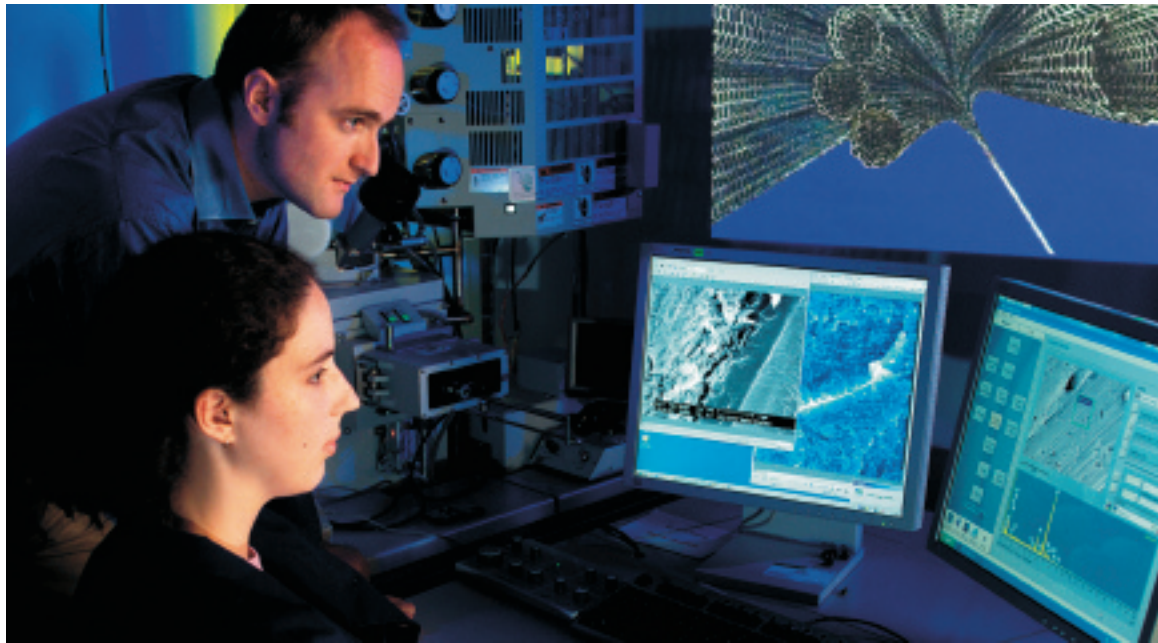
include an appeal before the administrative law judges in the USPTO Board of Patent Appeals," Fein said. "In almost all cases, this process results in the issuance of a patent."

Although the process can be tedious, the JSC Office of Chief Counsel does what it can to streamline the method of obtaining a patent.

"[It's] extremely labor-intensive and time-consuming. Much of the time involved is totally outside of our control," Fein said. "There is a tremendous, ever-growing backlog in the USPTO, and depending on the particular field of technology, can result in two years or more before a filed patent application is first picked up for examination by a patent examiner."

But there is a silver lining.

"We are continuously looking at ways to improve our process, and have in fact made significant process improvements in the last few years. Invention disclosures can now be submitted to us electronically, and the USPTO has recently introduced a very user-friendly process by which patent applications and related documents can be filed electronically," Fein said.



Bioreactor technology developed by NASA JSC provides great benefits to the medical community and medical therapies for long-term spaceflight. Pictured here, researchers study 3-D models on a computer.

But there are definite benefits to getting the patent, including monetary rewards and royalties, awards, and the pride and prestige one feels for creating something of value to industry and the public. Technology Transfer works to inspire employees to keep the inventive spirit and envision the technologies of the future.

"People ask me, 'What keeps you up at night?' And that's deciding what to work on," Brekke said, "There is no operating plan. Our objective is to incubate technologies for space exploration."

Although figuring out concepts for what seems to be unthinkable is no small feat, it is one that can be tackled with the right leadership, partnerships and time.

STS-116 crew debriefing

Employees, friends and other space buffs gathered at Space Center Houston on Jan. 22 for the STS-116 crew debrief event. The crew—commander Mark Polansky, pilot William Oefelein, European Space Agency mission specialist Christer Fuglesang and NASA mission specialists Joan Higginbotham, Robert Curbeam and Nicholas Patrick—shared stories and images from their 12-day, four-spacewalk mission. The only crew member absent was mission specialist Sunita Williams, who stayed aboard the International Space Station as a flight engineer for Expedition 14.



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